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THE ELIMINATION OF WASTE IN EDUCATION

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Six years ago the site where Gary now stands was a region of waste sand-dunes covered here and there with patches of stunted trees. Today there stands upon this site at the southern end of Lake Michigan the most complete system of steel mills west of Pittsburgh, and a rapidly growing city of some twenty-five thousand inhabitants.

The rapid growth of the city has brought to the school department a financial problem of peculiar difficulty. The population consists for the most part of immigrant foreign laborers, possessing but little taxable property. The city having been practically created by the United States Steel Corporation, naturally its plants are undervalued in the assessments for taxation. Still further embarrassment grew out of the fact that according to the laws of the state of Indiana, school revenues for any given year are obtained upon an assessment of property made almost two years before. In a city where the population had been doubling each year, the result was that the revenues for any given year were based upon an assessment made when the population was only about one-quarter as great. Furthermore, the method of distributing the state school revenues failed to recognize the pressing needs of a rapidly growing city. Revenues were apportioned on the basis of an enumeration made the previous April; but the enumeration was increasing 50 per cent between April and September, and another 50 per cent before the end of the school year.

Along with these unusual difficulties in the raising of current revenues there were on the other hand unusual immediate demands. In a city of slow growth, the school plant grows slowly and the yearly increase is no great burden upon the community; but in a new city having no school plant there was the immediate necessity

of creating a complete school plant in addition to the annual cost of instruction and maintenance.

There were two ways of meeting the situation. One was to build inferior buildings, omit playgrounds, school gardens, laboratories, workrooms, and assembly halls, to employ cheap teachers, to increase the size of classes, to cut down the yearly term to eight months, or to accommodate two shifts of children in the same building each day by doing half-time work. The other possible method was to create a thoroughly modern school plant, equipped with every modern necessity; then to operate it according to recently developed principles of scientific management, so as to get a maximum of service from a school plant and teaching staff of minimum size.

The majority of cities suffering from a shortage of funds choose some portion of the former alternative. Illustrations are sufficiently numerous, from New York and Chicago on the one hand down to the poorest school district on the other. Put the new city was being built by engineers, superintendents, and business managers who were familiar with the principles of scientific management in the steel industry; and when the educational engineer appeared and showed how it was possible to introduce similar principles of management into the operation of the school plant, his words fell upon understanding ears; and Gary, contrary to the usual plan, adopted the latter alternative.

The first principle of scientific management is to use all the plant all the available time.

In a school of the ordinary type, accommodating eight classes, let us say, of forty pupils each, but equipped in the most modern manner possible, there would be eight ordinary classrooms, each capable of seating forty children. In addition, there would be wide corridors, an assembly room, an indoor playroom or gymnasium, bathing and swimming-pool, shops and workrooms, science room, outdoor playground, and school garden. When all of the classrooms were in operation, the rest of the facilities of the plant would be lying idle. To the extent that the other facilities of the plant were actually being used, to that extent the classrooms would be lying idle. The result of such a policy is that half of the plant is idle half the time. In other words, the usual plant, if it is fully equipped

is operated during school hours at about 50 per cent of efficiency. The task of the educational engineer at Gary was to formulate a plan of operating his plant during school hours at 100 per cent efficiency.

DAILY PROGRAM NO. I

TIME	REGULAR STUDIES				SPECIAL ACTIVITIES				TIME
	Class-room I	Class-room II	Class-room III	Class-room IV	Basement, Garden, Attic, Auditorium Shops, Work-rooms, Laboratories	Playground			
8:45-10:15....	1A	2A	3A	4A	1B	3B	2B	4B	.... 8:45- 9:30
					2B	4B	1B	3B	.... 9:30-10:15
10:15-11:45....	1B	2B	3B	4B	1A	3A	2A	4A	.... 10:15-11:00
					2A	4A	1A	3A	.... 11:00-11:45
1:00- 2:30....	1A	2A	3A	4A	1B	3B	2B	4B	.... 1:00- 1:45
					2B	4B	1B	3B	.... 1:45- 2:30
2:30- 4:00....	1B	2B	3B	4B	1A	3A	2A	4A	.... 2:30- 3:15
					2A	4A	1A	3A	.... 3:15- 4:00

For a group of eight primary classes of forty pupils each he provided a plan of work as shown in Daily Program No. I. For the eight classes only four regular schoolrooms are required. While these classrooms are occupied by four classes, the other four classes are being accommodated half upon the playground and the other half in the workrooms, assembly room, school garden, science laboratory, or science excursions. The program is divided into regular and special studies. The regular studies in the elementary school consist of arithmetic, history, geography, and the formal language studies of reading, writing, spelling, and composition. The special activities are nature study, manual activities, drawing, literature, music, and play. Half the day is given by the pupil to the regular studies, and half the day to the special activities. The regular work consists of two periods of ninety minutes each, one in the forenoon one in the afternoon. The special studies are likewise.

given a period of ninety minutes in the forenoon and ninety minutes in the afternoon.

The ninety-minute periods devoted to special activities are each divided into two forty-five minute periods as shown in the program. The ninety-minute periods devoted to the regular studies are divided as the teachers see fit. Each teacher has one class that is not divided into sections and a certain portion of the regular studies to be covered in the three hours given to her. She is free to divide the time as seems best. Theoretically she is supposed to divide the time equally between recitation periods and study periods. This gives her an opportunity to train pupils in methods of study, to supervise their study, and to give individual help to those in need of it. During these study periods she is expected to do all the paper work that falls to her for the day, so that when her six hours' schoolroom service is ended, her day's work is done.

DAILY PROGRAM No. II

In actual practice it is found advisable to alternate the manual arts with the music, drawing, and literature so that each may have a ninety-minute period every other day.

TIME	REGULAR STUDIES				SPECIAL ACTIVITIES				TIME
	Class-room V	Class-room VI	Class-room VII	Class-room VIII	Science	Manual Arts	Music, Drawing, and Literature	Play	
8:45-10:15	5B	6B	7B	8B	5G	7G	6G	8G	. . . . 8:45- 9:30
					6G	8G	5G	7G	. . . . 9:30-10:15
10:15-11:45	5G	6G	7G	8G	5B	7B	6B	8B	. . . . 10:15-11:00
					6B	8B	5B	7B	. . . . 11:00-11:45
1:00- 2:30	5B	6B	7B	8B	5G	7G	6G	8G	. . . . 1:00- 1:45
					6G	8G	5G	7G	. . . . 1:45- 2:30
2:30- 4:00	5G	6G	7G	8G	5B	7B	6B	8B	. . . . 2:30- 3:15
					6B	8B	5B	7B	. . . . 3:15- 4:00

The daily program for the four upper grades of the elementary school is shown in Daily Program No. II. Putting the two pro-

grams together one has the daily program of a regular elementary school accommodating sixteen classes. This is done, however, with eight regular classrooms used in connection with special rooms and outdoor playgrounds. All the plant is used all the available time. None of it is idle any portion of the school day.

Although operating his plant six hours per day at the very high percentage of efficiency shown, still the educational engineer is not yet satisfied with the percentage of efficiency attained. The six-hour day is not enough. The plant might well be operated continuously from eight o'clock in the morning until six o'clock in the evening. The time once needed for chores at home is no longer used for that purpose in the majority of cases. It becomes "street and alley time," to borrow Superintendent Wirt's expressive phrase and tends toward the undoing of the work that is actually done under school conditions. A start has been made in an informal way toward remedying this lack. The playground teachers have charge of all of the playground facilities for an hour before school, during the noon hour, and for an hour or two after school. Since there is a larger number of playground teachers than usual, it is possible to divide this voluntary work among themselves so as not to require the attendance of any one of them for more than one of these extra periods per day. The plan is to be extended to the early and late use of laboratories and shops as well.

That an expensive plant should lie idle during all of Saturday and Sunday while "street and alley time" is undoing the good work of the schools is a further thorn in the flesh of the clear-sighted educational engineer. That the plant should lie idle is one loss. That work already done should be undone is a further loss. Scientific management demands that the school buildings be in use on Saturdays and Sundays. Gary has made a start in this direction by opening her buildings and placing the entire school plant at the disposal of the city's children for seven hours each Saturday. Attendance is voluntary; yet it amounts to about one-half of the total enrolment. One-half the teachers report for duty on Saturdays and are paid extra for all such voluntary services at the rate of one dollar per hour for those studies that are confining, and seventy-five cents per hour for the active and less exacting portions

of the work. The Saturday sessions are proving popular with both teachers and pupils.

There is a further loss of efficiency in the use of the plant by closing the building during the two months of summer. This alone is a loss of some 16 per cent, no small item in the calculations of the efficiency engineer. Several years before, Superintendent Wirt had established the all-year school divided into four quarters, at Bluffton, Indiana. Pupils were required to attend three of the quarters or nine months of the year. They could take as their vacation the quarter that seemed most desirable.

Naturally this feature of scientific management seemed to be a desirable means of economy at Gary; but unfortunately the antiquated legal machinery of the state forbade. All that is permitted them yet is the ten months of regular school, and the two months of voluntary vacation school. Gary will have the all-year school, however, as soon as the state officials see fit to make it legally possible.

A second principle of scientific management is to reduce the number of workers to a minimum by keeping each at the maximum of his working efficiency.

In the usual school system, in a building containing sixteen classes of forty pupils each, there would be sixteen regular classroom teachers. But in addition to these sixteen regular teachers, if the special activities were carried on as fully as modern conditions are demanding, there would be needed the services of additional special teachers of drawing, music, manual activities, elementary science, and organized play; or, if not special teachers, then numerous special supervisors of these subjects to aid the regular teachers.

But Gary does away with the extra expense for extra teachers or the overhead expense of unnecessary supervision by having specialization within the group. According to their system, for every sixteen classes there are needed only sixteen teachers, eight regular and eight special. Both regular and special teachers can be experts in their particular fields, requiring no supervisors other than the regular building principals and the city school superintendent. The plan, if employed in a large city, would probably require the services of a small expert staff of special supervisors. It reduces the number of workers, however, to a minimum.

Maximum working efficiency is brought about here as everywhere by division of labor, special preparation, and the adjustment of the load to the strength and capacity of the worker. The objections to the departmental plan of organization are met by placing the pupils under a classroom teacher for all the regular traditional school work, and by keeping each class intact throughout the day.

Teachers are not expected to do school work of any kind except during the periods of the day for which they are regularly employed. They are to do paper work during study periods and they are not to take books or papers home at night. The highest working efficiency demands certain qualities of personality that are not to be had without normal association with one's fellows, nor without proper and normal leisure occupations. One cannot be a proper teacher if he does not engage in the many varied activities that are normal for every completely developed human creature. Teachers are expected to live like other people, and when their day's work is done to leave it behind them as completely as other classes of workers.

Under present conditions in order to secure even reasonable efficiency, the special activities must usually be taken care of by special teachers. It is argued that if the immature pupil is able to cover the whole range of subjects, that certainly the regular teacher ought to be able to do the same sufficiently for teaching him in his immaturity. But as a matter of fact the special activities require special points of view and special attitudes of mind of such diversity that under present conditions at least it is not possible to secure regular teachers who can assume the different mental attitudes at all adequately. To be a leader in organized play, for example, requires a special type of personality, special attitudes of mind, a special understanding of the needs of the child and of the many directions of individual and social development that have their roots in play. The work requires a special form of dress, a specially developed physique, special training that covers years. Without these things on the part of the teacher, the work will be slighted. It is certain almost to be undervalued by the regular teacher and her valuation of the matter as a school activity is certain unconsciously to be transmitted to the minds of the pupils and to the minds of the parents. The last few years have shown the indispensable nature of a large amount of organized play directed by the playground

supervisor. Nobody but the specially trained playground teacher will do the work adequately in the face of the present general undervaluation on the part of the general community. It will never really get into the curriculum if left to the regular teacher.

The manual and industrial activities are in a similar position, as well as music, elementary science, school gardens, practical civic activities, and the like. Left to the regular teacher, they are academicized and devitalized simply because he cannot carry so many points of view. It may be possible for a few highly endowed individuals to see all these matters in so large a way that he can assume the various viewpoints and exchange mental and physical attitudes in passing from one to the other as frequently as required through the day; but it is not this type of individual that is teaching in the elementary grades of our public schools.

The burden must be adapted to the strength and capacity of the worker. To require so much of the elementary teacher of the usual type is to undermine physical vitality and mental integrity. It might well be different, however, if the so-called special studies were matters of the general community consciousness and if the teachers of our day have been effectively trained in all of them from their childhood up. The mental attitudes required by the special activities might then be as much matters of second nature as is the case with the regular studies. But for the immediate present it appears that teaching differentiation is the only practicable solution.

A third principle of efficient management is to eliminate waste. Ayers has given us the figures that measure the waste of retardation. Gulick and others have shown the waste that results from ill-health and lowered vitality. Social workers are pointing out the waste of undoing the pernicious effects of the vicious street and alley influences. Gary attempts to reduce retardation to a minimum by two or three methods. Teachers during the study periods give individual attention to the laggards, teaching them how to study, helping them to overcome difficulties. The voluntary Saturday classes and the summer vacation school classes receive a very large proportion of the backward pupils and aid in keeping them up to grade. Further, if a boy is weak in some particular subject, it is possible to give him double work in that subject. Let

us say a 4A boy is weak in arithmetic. It is possible for a time for him to omit some of his special activities and take arithmetic with the 4B class also, thus permitting double time in arithmetic. If he is weak in all of his regular studies it is easy to drop him out of his special activities for a time and permit him to do double work in the regular studies. The special activities are of such a sort that he can return to his classes there without difficulty.

Waste due to ill-health and lowered vitality is in large measure eliminated by employing a large portion of their time in outdoor play under playground teachers specially trained for the work. Pupils of lowered physical vitality are sometimes given double work in the special subjects, the regular studies being wholly omitted until they are sufficiently built up physically. One boy, for example, who was pronounced by the physician wholly unable to attend school, was placed in the special classes for double time and after six months was wholly cured. It was a case of sending a boy to school to make him well rather than the usual situation of taking a child out of school to make him well. The system combines the virtues of the open-air school with those of the regular school.

There is an attempt to eliminate the waste of labor in counteracting the evils of street and alley influences by extending the regular school days, by introducing much healthy play during a portion of the day, and by occupying the pupil for an additional voluntary two hours each day under the regular playground teachers; and for several hours on Saturdays. There is the definite intention of making the school the recreation center for the use of the city. They attempt to gather up in a unitary way in the school system the various influences which in Chicago, for example, are to be found in part in the school system and in part in the small parks recreation centers. They would look upon the introduction of the separate municipal recreation centers such as are being introduced into so many of our cities as a disastrous backward step.

In this connection a statistical comparison, made by Superintendent Wirt, of the uses of the recreational facilities of the Emerson School at Gary with the uses of similar facilities in the recreation centers of the South Park system, which is considered the best

of its kind in the world, shows the advantages of a unitary organization of educational facilities. The table shows the Emerson School to be from four to eight times as efficient as the average of these twelve small parks and to be from two to five times as efficient as most efficient of the small parks. This comparison is all the more striking when one remembers that the small parks of South Chicago are located in the most congested portions of the city whereas Gary has no congested district. And also that the recreation parks of the South Side vary in size from ten to sixty acres whereas the Emerson School plant includes only five acres.

TABLE I

COMPARISON OF THE NUMBER OF USES OF VARIOUS RECREATIONAL FACILITIES OF THE TWELVE SMALL PARKS OF THE CHICAGO SOUTH PARKS SYSTEM WITH THE NUMBER OF USES OF THE CORRESPONDING FACILITIES AT THE EMERSON SCHOOL AT GARY FOR TWELVE MONTHS

	CHICAGO RECREATION PARKS		EMERSON SCHOOL
	Average	Highest	
Outdoor gymnasium.....	164,314.	278,498	1,200,000
Indoor gymnasium.....	25,750	45,793	330,000
Swimming-pools.....	60,400	115,542	240,000
Library reading-room.....	48,940	85,933	300,000

As a means of caring for pupils that come from homes so vicious as to be subversive of all healthy educational influences, the Gary school system owns a farm of one hundred and sixty acres lying twelve miles outside the city. Here boys from twelve to eighteen years of age live in cottages that make up what they call "Boy-town." They attend school during school hours and work about the cottages and upon the farm during out-of-school time. They are paid for their labor at a definite rate, usually fifteen cents per hour; and in turn they are expected to pay their board, at the rate of three dollars per week. The school is neither a parental school, however, nor an orphan home. The boys are neither delinquent nor dependent, and their attendance is voluntary.

The work-cards for two weeks of one of the boys will show the nature of their work outside of school hours. During these two

weeks the earnings of the boys ranged from a minimum of \$9.30 to a maximum of \$18.01. After deducting board for the two weeks, surplus earnings amounted to \$3.30 as the lowest and \$11.81 as the highest. This out-of-school work is looked upon as an integral portion of their education.

TABLE II

WORK-CARD FOR TWO WEEKS OF ONE OF THE BOYS IN THE FARM SCHOOL

Date	Work Done	Time	Rate	Earned
December 18.....	Husking corn.....	2 hrs.	15c	\$0.30
December 19.....	Shoveling clay....	4 "	15	.60
December 20.....	Husking corn.....	3 "	15	.45
December 21.....	Mending tent.....	5 "	15	.75
December 22.....	Hauling wood.....	5 "	15	.75
December 23.....	Husking corn.....	3 "	15	.45
December 25.....	No work.....	0 "	15	.00
December 26.....	Laying linoleum...	8 "	15	1.20
December 27.....	Laying linoleum...	9 "	15	1.35
December 28.....	Laying linoleum...	9 "	15	1.35
December 29.....	Teaming.....	6 "	15	.90
December 30.....	Painting.....	8 "	15	1.20
	Total earned.....			\$9.30
	Board for two weeks.....			6.00
	Net earnings.....			\$3.30

A fourth principle of general scientific management is: Work up the raw material into that finished product for which it is best adapted. Applied to education this means: Educate the individual according to his capabilities. This requires that the materials of the curriculum be sufficiently various to meet the needs of every class of individuals in the community; and that the course of training and study be sufficiently flexible that the individual can be given just the things that he needs.

The program as shown above for the elementary grades, and this, by the way, is continued through the high school, appears to go a long way toward meeting both these requirements. If an individual is of the motor type of mind, with his interests lying in the field of manual industry, with neither tastes nor ability for abstract intellection—the type that is prematurely forced out of our schools uneducated and unprepared for his share of the world's work—he can be given a maximum of work in the special activities

and a minimum in the academic studies. Upon reaching the age when bookish studies tend to force him out of school, it is possible to give him double work along the line of manual activities and the correlated applied science, omitting the general studies entirely. This is being done at present for certain students who are taking trade courses in the high school. On the other hand, if one is clearly of the intellectualistic type of mind, preparing for a professional career, it may be desirable to give him a maximum of the general studies, and a smaller amount of the concrete activities. There might be periods when all his regular work should be for a time confined to studies of the academic sort, securing his physical exercise during out-of-school hours. The Gary plan is adapted to meet all such contingencies.

There is a very great degree of flexibility. A pupil can take all regular studies, and no special ones; three quarters, regular, and one quarter, special; half regular, and half special; one quarter regular and three quarters special; or all special. The schools are able to make an appeal to every type of student.

There is another aspect of this education according to need that is worthy of attention. The needs of boys are in part different from those of girls along lines of vocation, recreation, civic labors, and personal hygiene. The program of the grammar grades given above shows the separation of boys and girls beginning with the fifth grade. This is based upon no theoretical considerations as to the desirability or undesirability of coeducation. It is simply the practical and more or less unforeseen result of attempting to give to each pupil the thing that he needs.

The organization of classes for play, for gymnasium and swimming-pool, for manual activities, for applied science and mathematics as related to manual activities, brought about the placing of the boys in certain classes and of the girls in others. And further, at this age, it seems advisable that classes be kept together, and not broken up every hour as may be the case with departmental disorganization. The result is that the segregated classes formed for the special activities retain their unisexual character in the regular studies.

This in turn has its effect upon the teaching force. The boys

require masculine leadership in many of their activities, and the girls, feminine leadership. These practical demands insure the employment of sufficient proportions of both men and women in the system. Cries of calamity have been arising rather numerous of late on account of the disappearance of men from the profession. But as long as school activities consist of little more than academic matters to be poured into the heads of pupils, a task that can usually be better performed and almost always more gladly performed by women teachers, these Jeremiahs are not likely to accomplish the desired results. But constructive work as at Gary, not even raising the question, is solving the problem in the way in which the country in general is likely to solve it.

Other aspects of the system are reserved for later discussion.